

PATENT SPECIFICATION

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(54) PROCESS FOR THE MANUFACTURE OF PACKS CONTAINING PRE-COOKED POTATOES

(71) We, HAUPT - GENOSSEN-SCHAFT eGmbH, a Body Corporate organised under the laws of the Federal Republic of Germany of 46/50 Krausenstrasse, Hannover 3, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the manufacture of packs containing pre-cooked potatoes. For preserving cooked potatoes, the deep-freezing process is unsuitable since the potatoes are consumed almost daily in the household, as a fundamental and essential food stuff, and must therefore also be readily available for preparation of meals, this being a possibility which is not afforded by deep freezing due to the time required for thawing and heating. A still more important factor is, however, that due to the freezing process starch contained in the potatoes is converted to sugar and in this way the flavour of the potatoes is greatly impaired.

For this reason, other processes have been used such as permit storage of the cooked potatoes at temperatures up to a few degrees above freezing point, so that storage in standard domestic refrigerators or even in other cool places becomes possible. At such temperature, however, foodstuffs deteriorate very much more rapidly in the cooked condition than they do in the raw condition. Thus, it has hitherto not proved possible to achieve a preservation duration such as would guarantee that the goods will reach the consumer without undesirably large losses and, once having reached the consumer, will also remain capable of being stored for an adequately long period of time.

In a known process, the potatoes which have been peeled—if so required in the presence of steam—are cooked, refrigerated and packed in the water-tight condition, processing of the potatoes with chemical agents

being effected before cooking. Thus, the peeled potatoes are immersed in an aqueous solution of a sulphite or in an aqueous sodium hypochlorite solution, for the purpose of preventing any change in the colour of the potatoes under the action of air. Furthermore, the potatoes to be cooked are treated with a disinfecting or preserving agent, in order to keep the total number of germs in the cooked and packed potatoes below a predetermined value.

Apart from the fact that, for this process, a durability of only 14 days on storing at a temperature of lower than +5°C and only 4 days at a temperature of approximately 15°C is guaranteed, experience shows that the consumer hesitates to buy foodstuffs of which he knows (due to the obligation to mark such foodstuffs) that they have been chemically treated, even if it can be proved that what are concerned are agents which are not harmful to the health. Apart from this, no such commercially conventional agent is known which is able to destroy decay-producing spores.

Among the spore-formers there must be reckoned *inter alia* the aerobic soil bacteria which, substantially, are able to live and develop only where oxygen is available, development being especially assisted if the infected foodstuff is subjected to temperatures between 20 and 40°C (optimum approximately 30°C). It has been ascertained that with the low-degree sterilising treatment afforded by steam-peeling resistant spore groups of this kind can by no means be destroyed. During the manufacturing process, they develop further and in this way greatly diminish the duration of preservation.

Apart from the spores, in rare cases also infection with dangerous, anaerobic botulism bacteria (anaerobic spore-formers exhibiting a high degree of resistance to heat) is possible, and these bacteria may develop under exclusion of oxygen, so that they may find suitable conditions for development when vacuum-

packing is effected in foils which are impermeable to oxygen.

The invention is based on the problem of how to achieve a process for the manufacture of packs containing pre-cooked potatoes, whereby a considerable increase in the preserving duration may be achieved, without using chemical agents, the said process being distinguished by the fact that it is extremely economical and also permits a high output.

According to the present invention, there is provided a process for the manufacture of packs of dry pre-cooked potatoes, wherein in a continuous operation cycle the potatoes are firstly peeled, and are then vacuum-packed in foil packs and pre-cooked by being heated in the packs, characterised in that before the packing the peeled potatoes are subjected to an intensive heat treatment in a hot gas or steam atmosphere until a thin surface layer of each potato has assumed a temperature of substantially 120°C.

An important factor of the invention consists in that the preparation of the potatoes has to take place "in one operation", from the starting condition up to the last process step whereby the pack is obtained ready-for-sale, each individual process step taking place under conditions which to a considerable extent prevent, from the outset, any coming into being or propagation of organisms producing deterioration.

In the preferred process, the first step in this direction is taken in a steam-peeling plant into which the potatoes are introduced, after having been pre-sorted according to size and subjected to pre-washing, and where they are processed with high-pressure steam at 7 atmospheres above atmospheric under heat radiation at approximately 130—140°C. The times of stay within the steam-peeling installation are between 15 and 30 seconds depending on the state or quality. After this short steam and heat "shock", the outer skin or peel of the potato is "burst off", the high temperature simultaneously providing for the destruction of the heat-unstable germs always present on the surface of the potatoes. The peeled potatoes pass, after leaving the steam-peeling plant, via a station wherein post-washing is effected, to a testing device which tests the result of the peeling operation, by electronic and preferably photoelectrical means, and automatically separates from the good potatoes those potatoes which still contain defects such as for example eyes, damaged portions or peel residues. The sorted-out potatoes are preferably once again introduced into the steam-peeling installation wherein appropriate further processing is effected.

Tests have shown that the zone in which the bacteria are able to develop and in which their presence may be shown in the potatoes

has a depth of only a few millimetres. For this reason, the steam-peeling process is followed, as an essential step of the process according to the invention, by a process whereby the potatoes are intensively heated, thus ensuring that the zone in which bacteria may be present is reliably subjected to heating to such an extent that the bacteria are destroyed therein. For this purpose, hot air at a temperature of at least 130°C (maximum 800°C and preferably about 400°C) is blown on to the potatoes at a flow velocity of between 1 and 8 m/sec. At the same time, the external conditions must be so selected that a temperature of approximately 120°C down to a depth of 10 to 12 mm. into the potato is attained. It has been found to be expedient to rotate the potatoes in the impinging hot air during this heat treatment, so as to avoid burning. Due to the rotation, the result is achieved that the potatoes are acted-upon by the flow of hot air on all sides. In order to prevent the potatoes from burning at the high temperature, it is furthermore expedient to mix steam with the hot air. The time during which the heat is allowed to act on the potatoes ranges between 5 and 20 minutes. The value of the process parameters are to be adapted in each particular case to the product to be processed, since these values depend on the type of potato, the season, the "year" of the potatoes, storage before processing, the composition of the potatoes, the area in which they were cultivated, and also the peeling process. The penetration depth of the necessary temperature may readily be ascertained by means of heat-sensors. Furthermore, the penetration depth may be perceived also optically due to a change in the colour of the potato substance.

After this intensive heat treatment, the potatoes pass to the packing station where they are packed, vacuum-tight, in foil by means of a deep-drawing process. Also this process is effected fully automatically under almost germ-free conditions. Following thereon, the packed potatoes are then subjected to the process whereby they are finally fully cooked.

The intensive heat treatment before packing in combination with maintenance of freedom from germs up to packing has a series of advantages. Thus, the potato exhibits a relatively high degree of heat-permeability after this heat treatment, whereby it becomes possible to effect the process whereby they are finally fully cooked in a ready manner. Furthermore, the said process resulting in the potatoes being fully cooked may be effected at a temperature of slightly below 100°C. As a rule, for reasons connected with the killing of germs, the cooking process has hitherto been effected at temperatures above 100°C. At these high temperatures, a reac-

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- tion is set up between carbohydrates and amino acids (the so-called Maillard reaction) which results in brown discoloration of the potatoes. Furthermore, this temperature involves impairment of digestability, a diminution in the nutrient value and a loss of vitamin C. It was furthermore surprisingly ascertained that as a result of the heat treatment before packing the finished product exhibits practically speaking no water-exuding property and no starch loss whatsoever, so that in contradistinction to all hitherto known processes the potatoes remain dry and retain their natural colour even after relatively long storage in the pack. This preservation of the attractive appearance of the product is decisive factor for sales success. Finally, the process according to the invention makes it possible to dispense with refrigeration and therewith with costly refrigeration systems of conventional type. In the case of the process according to the invention, cooling may be effected in the ambient temperature available or cooling in a water bath will suffice, so as not to unnecessarily prolong the process.
- An installation for the performance of the process according to the invention is shown, by way of example, in the accompanying drawing.
- From the potato bunker 1, the potatoes travel via a sorting installation 2, into the steam-peeling plant 3 wherein pre-washing is effected prior to steam-peeling and post-washing is effected subsequent to steam-peeling. The steam-peeled potatoes then pass through a testing device 4 wherein they are tested for defective portions by photoelectrical means. Not entirely satisfactory potatoes are sorted-out and returned to the steam-peeling plant 3. Only entirely satisfactory potatoes then pass into a rotating drum 5 which may be designed in the manner of a basket and in which the intensive heat treatment is effected. From there, the potatoes pass to the weighing device 6 in which the quantities required for packing are separated-off. The weighed potato portions are then fed to a vacuum deep-drawing automatic machine 7 in which they are packed air-tight in foil. In the following arrangement 8 in which the potatoes are brought to the condition in which they are fully cooked, the potatoes are heated-up and brought to the fully cooked condition in saturated steam. After being brought to such a completely cooked condition, the potatoes may travel through a cooling tunnel 9 and, finally, reach the automatic packing machine 10 which issues the product ready-for-sale.
- Thus, the entire production is effected fully automatically without any kind of manual labour. Tests have shown that the product is, at the end of the manufacturing line, in a sterile condition such that it remains preserved for a period of time which is longer by several orders of magnitude than hitherto achievable with hitherto known processes. The potato packs extracted from the manufacturing line before travelling through the cooling tunnel were stored for 14 days in an incubator at a temperature of +30°C, i.e. at an optimum temperature for spore formation, without the durability thereof suffering.
- For potatoes of the Clivia type, harvested in July 1969 in the cultivation area of Lower Saxony, 48 hours old and having a starch content of approximately 11%, the following process conditions have been found to be satisfactory in practice: temperature of the hot air introduced into the drum 5: approximately 380°C; velocity of flow of the hot air: 4 to 5 m/sec; diameter of the drum: 30 cm; speed of rotation of the drum: 10 to 12 r.p.m.; time of stay in the drum: 13 minutes; time for fully cooking with the oven heated-up: 25 minutes.
- WHAT WE CLAIM IS:—**
1. Process for the manufacture of packs of dry, pre-cooked potatoes, wherein in a continuous operation cycle the potatoes are firstly peeled, and are then vacuum-packed in foil packs and pre-cooked by being heated in the packs, characterised in that before the packing the peeled potatoes are subjected to an intensive heat treatment in a hot gas or steam atmosphere until a thin surface layer of each potato has assumed a temperature of substantially 120°C.
 2. Process according to claim 1, wherein the intensive heat treatment is effected with flowing hot air having a temperature of at least 130°C, at most 800°C, and preferably about 400°C.
 3. Process according to claim 2, wherein the flow velocity of the hot air is 1 to 8 m/sec.
 4. Process according to claim 3, wherein the hot air has atmospheric steam mixed with it.
 5. Process according to any one of the preceding claims, wherein the potatoes are, for the intensive heat treatment, introduced into a rotating drum.
 6. Process according to claim 5, wherein the time of stay of the potatoes in the drum is 5 to 20 minutes.
 7. Process according to any one of the preceding claims, wherein the temperature of the hot air, the flow velocity thereof, the quantity of steam, the rotation velocity of the drum and the time of stay are so selected that a temperature of approximately 120°C down to a depth of 10 to 12 mm is established in the potatoes.

8. Process according to any one of the preceding claims, for the manufacture of packs containing steam-peeled pre-cooked potatoes substantially as described herein.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

